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AFRICA RISING - Enhancing partnership among Africa RISING, NAFAKA and TUBORESHE CHAKULA Programs for fast tracking delivery and scaling of agricultural technologies in Tanzania Annual Report

01 October 2019 – 30 September 2020

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Contract/Agreement No: BFS-G-11-00002
Activity Start Date and End Date: 01 October 2017 to 30 September 2020
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IITA
Transforming African Agriculture

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Cover photo
Project beneficiraies participating in the different activities. Photo credit: Haroon Sseguya/ IITA.

I. ACTIVITY OVERVIEW/SUMMARY

Activity Name:	AFRICA RISING - Enhancing partnership among Africa RISING, NAFAKA, and TUBORESHE CHAKULA Programs for fast tracking delivery and scaling of agricultural technologies in Tanzania.
Activity Start Date:	1 October 2017
Activity End Date:	30 September 2020
Name of Prime Implementing Partner:	International Institute of Tropical Agriculture (IITA)
Contract/Agreement Number:	BFS-G-11-00002
Name of Subcontractors/Sub awardees:	• Agricultural Research Institute (ARI), Dakawa/Chollima • Agricultural Research Institute (ARI), Hombolo • Agricultural Research Institute (ARI), Uyole • International Center for Tropical Agriculture (CIAT)
Major Counterpart Organizations	• District Agricultural Councils
Geographic Coverage (districts, regions, and/or Zanzibar)	• Wanging'ombe District (Njombe Region) • Kilombero District (Morogoro Region) • Iringa Rural, Mufindi, and Kilolo Districts (Iringa Region) • Mbarali District (Mbeya Region) • Mbozi and Momba Districts (Songwe Region)
Reporting Period:	01 October 2019 – 30 September 2020

1.1 Executive summary

The Africa RISING-NAFAKA partnership project focuses on the delivery and scaling of promising interventions that enhance agricultural productivity in Tanzania. The key interventions are the promotion of climate-smart agricultural innovations, dissemination of best-bet crop management packages, rehabilitation and protection of natural resources, and reduction of food waste and spoilage. The project focus is on three crop enterprises—maize, rice, and legumes (common bean, chickpea, cowpea, and green gram). It includes one USAID-funded project under the Feed the Future (FtF) initiative in Tanzania (CMSD/NAFAKA), Tanzania Agricultural Research Institute (Dakawa, Hombolo, and Uyole centers), district councils, and the private sector (agro-input companies, millers, and processors). During the past year, project activities were implemented in eight districts in the regions of Iringa, Mbeya, Morogoro, Njombe, and Songwe, all in the FtF Zone of Influence (ZoI).

The project implemented included the following:

i. Establishment of 258 mother demonstration (demo) plots: 117 for maize, 52 for rice, and 89 for beans. We also established 240 model farms (190 for rice and 50 for maize); the demo plots and model farms act as learning and practice sites for farmers, respectively.

ii. Training of 116 Government extension staff (91 male, 25 female), 36 village-based agricultural agents (VBAAs) (26 male, 10 female), and 106,161 smallholder farmers (59,600 male, 46,561 female) on good agricultural practices (GAPs), and natural resource and postharvest management. We also trained 112 new producers of Quality Declared Seed (QDS) on seed production principles and certification (63 male, 49 female).
iii. Supporting the production of QDS for beans (161 farmers growing 65.1 ha) and rice (204 farmers growing 105 ha). About 680 tof QDS were produced (631.1 t of rice and 48.8 t of beans), an increment of about 69% above the 2018/19 yields (403 t combined) due to increased demand. For the QDS producers, activities towards strengthening their associations were implemented so that they can access services after the end of the project. The activities focused on capacity building in leadership, record keeping, and operations. Planned training activities towards developing capacities in savings and credit mobilization as well as conflict management, lobbying, and advocacy were constrained by the COVID-19 outbreak because intensive group training activities could not be implemented.
iv. Integrating ICTs in agriculture for better scaling. ICT activities were developed, focusing on short messaging services (SMS), video messaging, and GIS-based tools. These included profiling farmers to understand their needs, developing messages suited to their needs, and enhancing partnerships for ICT integration. Regarding GIS, a compendium of maps that can be used for the scaling of technologies was developed. In addition, as a result of limited physical interaction with farmers due to the COVID-19 outbreak, radio programs were developed and aired on six community radios in the eight project beneficiary districts —about 90,000 farmers were reached as a result of this activity.
v. Developing training materials for all the project components that will be used by partners for better scaling of the technologies.

Yield data were collected and analyzed with advantages shown in respect of the technologies promoted, as in the past years: For rice, improved varieties yielded 7.5–8.0 t/ha compared to 6.1 t/ha for the local varieties. Similarly, with farmers' conventional practices the improved varieties also yielded more (6.1–6.2 t/ha) than the local varieties (5.1 t/ha). For maize, yield response to application of agricultural lime indicated an advantage of 350 to 800 kg/ha, depending on the maize variety. In semiarid locations, relatively higher yields were obtained from crops planted on ridges (open and tied) as a soil and water management technology compared to flat beds. The harvests were in the range of 1.7–3.8 t/ha for flat beds, 2.3–4.7 t/ha for open ridges, and 2.7–4.9 t/ha for tied ridges. Still, the yields were consistent for all locations, with differences being accounted for in terms of variety used, indicating the importance of choosing varieties suitable for a given agroecology.

Overall, 99 792 farmers applied at least one management technology on 123,037.3 hectares.

The key challenges faced by the project during the reporting period were (i) outbreak of fall armyworm (FAW) in January 2020 in Songwe and Iringa regions. However, the pest was well managed with technical assistance provided to farmers by extension staff and VBAAs as well as rural agrodealers stocking the right pesticides for use in the fields; (ii) heavy rains that led to the destruction of some crops (especially beans and rice) and delays in the establishment of demos and QDS farms; and (iii) limited implementation of field-based activities due to the COVID-19 outbreak. Consequently, various options of communicating the key messages through digital platforms were implemented. The budget

for the reporting period was US$1,000,000 and the actual expenditures are reported in a separate financial report.

1.2 Summary of results to date

Indicators	FY 19/20 target	Q1 FY19/20	Q2 FY19/20	Q3 FY19/20	Q4 FY19/20	Achievements FY 19/20	Percentage achieved FY20	LOP target	LOP achievements to date	LOP percentage achieved
EG.3.2 Number of individuals participating in USG food security programs [IM-level]	70,852	27,725	43,851	28,179	6,522	70,270	150%	70,852	106,277	150%
*EG.3.2-24 Number of individuals in the agriculture system who have applied improved management practices or technologies with USG assistance [IM-level]	66,188							66,188	99,792	151%
*EG.3.2-25 Number of hectares under improved	92,000							92,000	126,037.3	137%

management practices or technologies with USG assistance [IM-level]										

1.3 Evaluation/assessment status and/or plan

Assessment Type	**Planned for (date)**	**Status**
Annual outcome survey	September 2020	Completed

2. ACTIVITY IMPLEMENTATION PROGRESS

2.1 Progress narrative

Africa RISING and its partners are involved in the delivery of agricultural information and technology packages through a network of projects and other public and private sector actors, including ACDI/VOCA that leads NAFAKA, the USAID-funded cereals project in Tanzania. These collaborations aimed at improving efficiency and enhancing disciplinary integration while contributing to the goals of the Global Food Security Strategy (GFSS) of harmonizing regional efforts to fight hunger and poverty in countries with chronic food insecurity and insufficient production of staple crops. Attractive interventions in this project include the promotion of climate-smart agricultural innovations, dissemination of GAPs, rehabilitation and protection of natural resources, and postharvest management.

The project focuses on three crop enterprises (maize, legumes, and rice) with postharvest handling and nutrition as cross-cutting themes. The key partners in the project include the International Institute of Tropical Agriculture (IITA) as the lead institution, three centers of the Tanzania Agricultural Research Institute (TARI)—Dakawa, Uyole, and Hombolo—and one USAID-funded cereal crops project, NAFAKA (led by ACDI/VOCA). These work in partnership with the district local government institutions, specifically District Agricultural Irrigation Cooperative Officers (DAICOs), the private sector (seed companies, millers, and processors), and nongovernmental organizations (NGOs) to deliver on the following objectives:

1. Introduce and promote improved and resilient varieties of food crops to farm households in a manner that complements their ongoing farm enterprises, contributes to sustainable agricultural resource management, and offers nutritional advantages and alternative marketing channels.
2. Disseminate GAPs along with the most promising new crop varieties suited to widely representative agroecological zones and market proximity.
3. Protect land and water resources and foster agricultural biodiversity through the introduction of soil and water management practices.
4. Introduce and promote postharvest management technologies for maize, rice, and legumes to reduce losses and bring quality up to marketing standards.
5. Offer and expand capacity-building services to members of grassroots farmer associations, platform partners, and development institutions in the scaling process, paying particular attention to the special opportunities available to women farmers as technical and nutritional innovators and resource managers.

The project is currently being implemented in five regions in Tanzania: Iringa, Mbeya, Morogoro, Njombe, and Songwe, all in the FtF ZoI (Fig. 1).

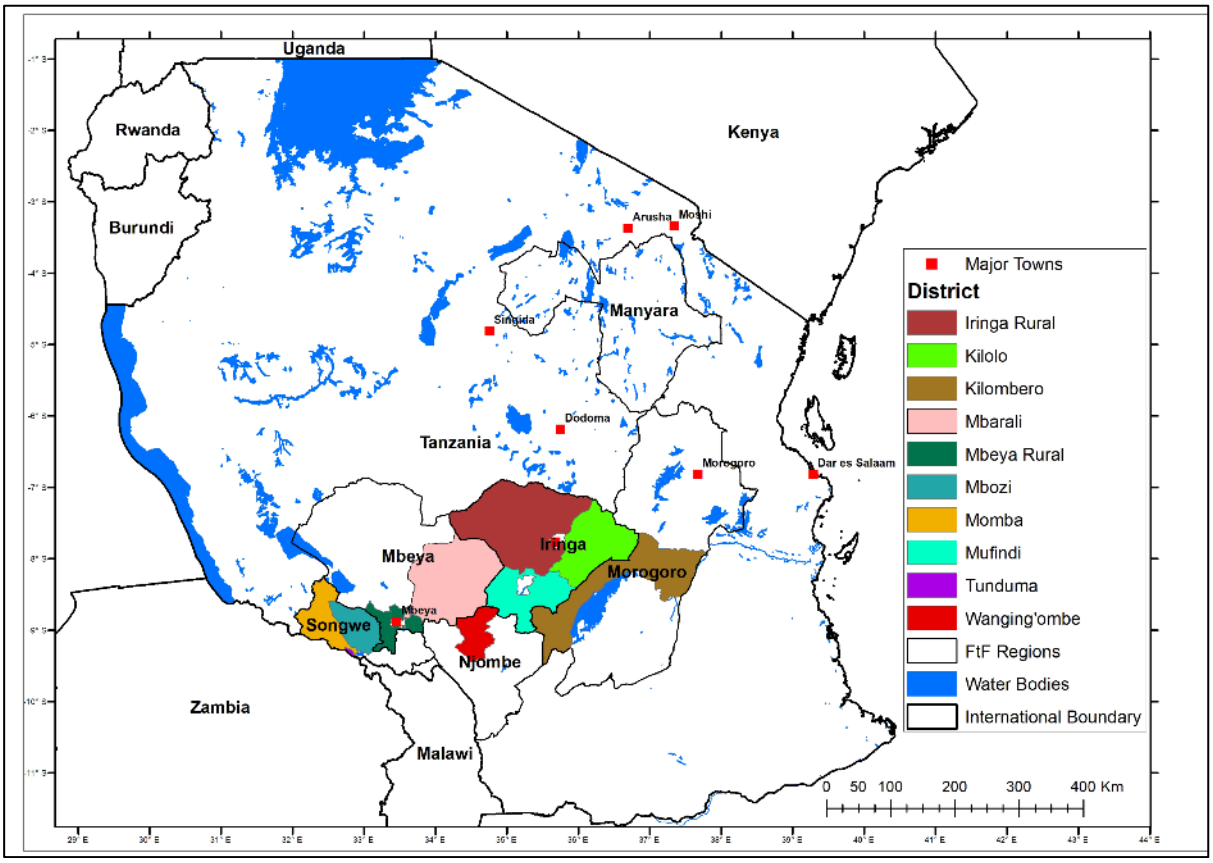

Figure 1: Project locations.

All project activities contribute to the Development Objective (DO2) of the USAID Tanzania Country Development Cooperation Strategy (CDCS, 2014–19), i.e., inclusive broad-based economic growth sustained. This was Year 3 and the final year of the second project phase, and we planned to achieve the Life of Project (LoP) targets of 70,852 individuals benefitting from the project activities and 92,000 ha under improved technologies as a result of the project interventions.

2.2 Implementation status and planned activities

2.2.1 Procurement of agro-inputs and establishment of demo sites

Agro-inputs for establishing demo and QDS sites were procured and delivered to all districts. These included 9.346 t of rice seed, 5.5 t of maize seed, 7.5 t of common bean seed, 22 t of agricultural lime, and 15.3 t of fertilizers. Of these, the Africa RISING project procured 9.346 t of rice seed, 22 t of agricultural lime, 600 kg of fertilizers, and 6.3 t of improved bean seed. The rest were received from partners as follows: 14.5 t and 150 kg of fertilizers from OCP and ETG, respectively, and for maize seed (5.5 t) the contributors included CORTEVA 4.2 t, BEULA 1 t; SEEDCO 240 kg, AGRISEED 100 kg, and Monsanto 20 kg. The International Center for Tropical Agriculture (CIAT), through the AfDB-funded TAAT High Iron Bean Compact, contributed 1.2 t of common beans and also worked closely with the project towards scaling of the bean technologies. Tables 1, 2, and 3 indicate the different amounts of agro-inputs procured for demos in the 2019/20 cropping season.

Table 1. Type and amount of seeds of improved rice varieties procured and delivered for use in each district (for demos, QDS, and microplots).

District	**Variety and amount of seeds per group**							**Total** (kg)			
	Mother demos (kg)				**Micro-plots** (kg)		**QDS** (kg)				
	SATO 1	**SATO 6**	**TXD 306**	**Komboka**	**TXD 306**	**Komboka**	**TXD 306**	**SATO 1**	**SATO 6**	**TXD 306**	**Komboka**
Mbarali	1	1	20	20	2000	1000	690	1	1	2710	1020
Momba	-	-	10	10	300	200	100	-	-	410	210
Kilombero	-	-	10	10	2750	450	1100	-	-	3860	460
Iringa rural	2	2	10	10	300	200	150	2	2	460	210
Total	**3**	**3**	**50**	**50**	**5350**	**1850**	**2040**	**3**	**3**	**7440**	**1900**
Grand total								**9346**			

Table 2. Fertilizers procured (by type) for demo sites in Iringa, Morogoro, Njombe, and Songwe regions.

Type of fertilizer	**Quantity (kg)**
DAP	750
NPK	500
CAN	2639
Urea	6503
NPS	758
NPSZ	4153
Agricultural lime	22,000
Total	**37,303**

Table 3. Maize and bean seeds (by variety) procured for demo sites, model farms, and QDS fields in Iringa, Njombe, and Songwe regions.

Maize		**Common beans**	
Seed variety	**Amount (kg)**	**Seed variety**	**Amount (kg)**
PAN 691	1050.7	Jesca	3200
PAN 15	1015.25	Uyole 03	1300
PHB 30G19	889	Seliani 14	1200
PHB 3812	1226.35	Njano Uyole	1800
SC 719	104.5		
SC 627	136.25		
UH 615	500		
UH 5350	500		
H12	50		
H 352	50		
DKC 777	16		
DKC 8053	4		
Total	**5500**		**7500**

After procurement and distribution of the agro-inputs, we then established 258 demos (117 for maize, 89 for beans, and 52 for rice) and 240 model farms (50 for maize and 190 for rice technologies), all spread over 160 villages in the project districts. Tables 4–6 show the distribution of the demos and model farms by district. The demo sites act as principal learning and training sites for extension staff, farmers, and other stakeholders. At the same time, the model farms are avenues for providing opportunities for selected farmers to apply the approved technologies at a larger scale (at least one acre) and provide an opportunity for peer learning.

Table 4. Maize/legume demonstration sites established during the 2019/2020 cropping season.

District	**Type of demo**		
	Maize		***Beans***
	Maize variety/fertilizer/lime	*Maize variety/fertilizer/ SWM*	*Common bean variety vs fertilizer*
Iringa DC	13	7	20
Kilolo	30	7	10
Mufindi	10		10
Wanging'ombe	8	2	10
Mbozi	25		24
Momba	15		15
Total	101	16	89

Table 5. Rice demo sites established during the 2019/2020 cropping season.

District	Type of rice demo			
	Improved varieties/fertilizers (VarFer)	*Improved varieties/managing salt-affected soils (SAS)*	*Improved varieties/alternate wetting and drying technology (AWD)*	***Total***
Mbarali	20	-	1	21
Iringa rural	8	2	1	11
Momba	10	-	-	10
Kilombero	10	-	-	10
Total	**48**	**2**	**2**	**52**

Table 6. Model farms for maize and rice established in the 2019/20 cropping season.

District	Maize	Rice	Total
Iringa rural	8	26	34
Kilolo	7		7
Mufindi	5		5
Wanging'ombe	5		5
Mbozi	15		15
Momba	10	29	39
Kilombero		40	40
Mbarali		95	95
Total	**50**	**190**	**240**

2.2.2 Training activities

Four general categories of training activities were conducted. The first was for government extension staff and village-based advisors in the form of two-day residential boot camps each (in five locations) to enhance their capacities to deliver quality services to project beneficiaries. The focus of the training was on:

i. Criteria for the selection of sites for demo plots and demo layout.
ii. Soil properties and soil nutrients.
iii. Seeds and seed quality.
iv. Land preparation methods.
v. Soil and water management.
vi. Soil fertility management, including the need to use soil amendments.
vii. Safe handling and use of chemicals.
viii. Pests and disease management/control methods.

The training was attended by 152 participants as indicated in Table 7.

Table 7. Participants at the bootcamps conducted for GoT extension staff and VBAAs.

District	Extension staff			VBAAs		
	Male	*Female*	*Subtotal*	*Male*	*Female*	*Subtotal*
Kilombero	8	3	11	4	1	5
Iringa	10	5	15	2	2	4
Kilolo	14	2	16	4	-	4
Mufindi	8	2	10	3	1	4
Wanging'ombe	5	2	7	1	2	3
Mbarali	12	3	15	3	2	5
Mbozi	15	4	19	6	1	7
Momba	19	4	23	3	1	4
Total	91	25	**116**	26	10	**36**

TARI Uyole and TARI Hombolo staff training Government Extension staff and Village Based Agriculture Advisors (VBAAs) on rainwater harvesting using the tied ridges during the boot camp at Mafinga town. Photo credit: Filbert Mzee/ACDI VOCA.

Filbert Mzee of NAFAKA (standing, cetner) explains a concept during a training workshop for Government Extension staff and Village Based Agriculture Advisors (VBAAs) in Kilombero District. Participants at the event were trained on methods of combating invasive pests in paddy rice production. Photo credit: Ezekiel Mtoka/ACDI VOCA.

The second category of training was for farmers of maize and legumes, focusing on:

i. Water harvesting technologies (ridging and tied ridging) for semiarid areas of lower Kilolo, Iringa Rural, and some parts of Wanging'ombe District.
ii. Soil fertility management, liming, and control of soil erosion in areas with steep slopes (Kilolo).
iii. Use of preemergence and postemergence herbicides for weeding.
iv. Use of improved varieties of maize and legumes.
v. Use of pesticides for pest and disease control in maize and common beans.
vi. Postharvest management.

For rice farmers (third category), the focus of the training was on:

i. Nursery management.
ii. Land preparation.
iii. Planting.
iv. Fertilizer application.
v. Management of weeds, insect pests, diseases.
vi. Harvesting and postharvest management.

Table 8 shows the distribution of farmers trained from each district.

District	Male	Female	Total
Iringa Rural	7401	6140	13,541
Kilolo	8570	7215	15,785
Kilombero	12,165	10,736	22,901
Mbarali	12,024	8802	20,826
Mbozi	7958	5688	13,646
Momba	5713	2628	8341
Mufindi	3564	3503	7067
Wanging'ombe	2205	1849	4054
Total	**59,600**	**46,561**	**106,161**

The fourth category of training activities was for new producers of QDS, which the project expanded to ensure that more farmers benefit. In this regard, 112 new producers, entirely drawn from the youth category (at most 29 years of age) were trained in partnership with the Tanzania Official Seed Certification Institute (TOSCI). The focus was on:

i. Production principles for QDS.
ii. Seed act and regulations governing seed industries in Tanzania.
iii. QDS inspection guidelines.

The participants were co-selected with extension staff, district seed inspectors, NAFAKA seed specialists, and farmer leaders. After the training, the trainees received on-farm support from the government extension and project staff before they started planting. Table 9 shows the distribution of the trainees by district.

Table 9. Distribution of QDS trainees by district.

District	Common beans			Rice		
	Male	*Female*	*Subtotal*	*Male*	*Female*	*Subtotal*
Kilombero	-	-	-	27	23	50
Iringa	3	6	9	2	3	5
Wanging'ombe	4	4	8	-	-	
Mbarali	-	-	-	6	6	12
Mbozi	8	7	15	-	-	
Momba	10	0	10	3	0	3
Total	**25**	**17**	**42**	**38**	**32**	**70**

Youth and women in Njombe District getting trained about the principles of bean QDS seed production. Photo credit: Filbert Mzee/ACDI VOCA.

2.2.3 Quality Declared Seeds production

This project continued to work closely with the NAFAKA project to strengthen access to and scaling of the availability of quality rice and common bean seeds. In addition to the 112 youth newly mobilized during 2019/2020, the project supported an additional 253 farmers to produce QDS. All the producers were guided on quality seed production based on guidelines provided by TOSCI and were also provided with basic seed from TARI institutes. Rice QDS farmers (204) established 105 ha and 161 bean QDS producers established 65.1 ha leading to the production of 631.1 tand 48.8 tof rice QDS and bean QDS respectively (Tables 10 and 11).

Table 10. Quantity of rice QDS produced and certified in 2020.

District	Number of farms	Hectares (ha)	Production (t)
Kilombero	110	48.6	231
Mbarali	69	46.3	362.4
Momba	10	4	17.5
Iringa Rural	15	6.1	20.2
Total	204	105	631.1

Table 11. Quantity of common bean QDS produced and certified in 2020.

District	Number of producers	Area (ha)	Production (t)
Momba	30	12.1	3.2
Mbozi	46	18.6	24.4
Wanging'ombe	15	6.1	5.6
Mufindi	30	12.1	7.5
Kilolo	15	6.1	2.9
Iringa Rural	25	10.1	5.2
Total	161	65.1	48.8

2.2.4 Yield data

Data on the effect of packages being taken to scale by the project on production levels were collected from the mother demos. Data were also collected from model farms managed by beneficiary farmers. For rice, the package consisted of the use of improved varieties (SARO 5 and Komboka), fertilizers, and other GAPs, and indicated that, as for previous years, with or without fertilizers and other GAPs, improved varieties led to higher yields than local varieties. With GAPs, improved varieties yielded 7.5–8.0 t/ha compared to 6.1 t/ha for the local varieties (Fig. 2). Similarly, under farmers' conventional practices the improved varieties also yielded more (6.1–6.2 t/ha) than the local varieties (5.1 t/ha).

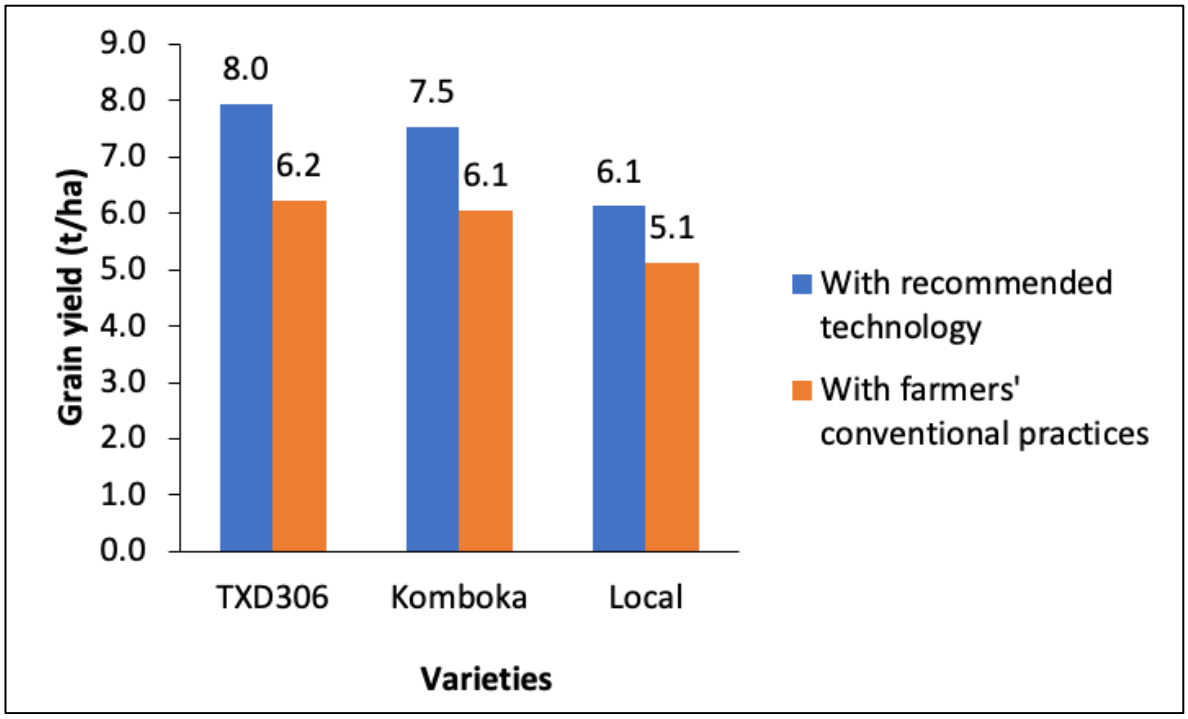

Figure 2. Yield of improved and local rice varieties grown with recommended GAPs or under conventional practices (mother demos) in the project districts.

For maize, scaling activities focused on the use of lime to unlock the potential of improved maize varieties and other GAPs. As shown in Table 12, relatively higher maize yields were obtained from plots where agricultural lime was applied at the recommended moderate rate of 2 t/ha compared to yields on plots receiving only fertilizers. Maize yield response to the application of agricultural lime was consistent across all districts, thus confirming the benefit of using lime in maize production. The average yield increases were in the range of 166 to 710 kg/ha, depending on the maize variety—the yields of maize varieties with high yield potential, namely MAMS913, SC 719, and PAN, were boosted most. Nevertheless, maize yield at different sites varied widely within and between varieties depending on climatic and soil conditions of sites.

Table 12. Effect of lime application to maize grain yield (kg/ha), combined for Mbozi, Iringa, Mufindi, and Wanging'ombe districts.

Maize variety	Liming practice		
	Without lime	With lime	SED $_{(0.05)}$
MAMS913	5189	5468	79**
MERU513	4742	5023	143**
PAN691	5341	6051	78
PHB30G19	4891	5483b	78
SC719	5230	5794	109
UH6303	4745	5204	109**
WH505	5106	5272	79**

SED = Standard error of the difference between liming practice means (** Significant P < 0.05).

Further, in semiarid locations (Iringa Rural, Kilolo, and Wanging'ombe districts), relatively higher yields were obtained from crops planted with ridges (open and tied) as a soil and water management technology compared to flat beds. The average harvests were in the range of 2.3–3.2 t/ha on flat beds, 3.5–4.3 t/ha with open ridges, and 4.0–4.7 t/ha with tied ridges (Table 13). The yields were also consistent for all districts, with differences being accounted for in terms of the variety used and specific sites as indicated by huge differences in yield ranges. Best yields were obtained from the more drought-tolerant varieties (PHB30619, WH505, and MERU 513), once again emphasizing the importance of choosing the most suitable varieties, among other considerations.

Table 13. Effects of soil and water management (SWM) practices and variety on maize grain yield (kg/ha) in semiarid areas of Iringa, Kilolo, and Wanging'ombe districts.

Maize variety	SWM practice			SED $_{(0.05)}$
	Flat cultivation	Open ridges	Tied ridges	
BEULA	2325	3532	4045	319**
MAMS913	3063	4144	4569	265**
MERU513	3185	4283	4745	197**
PHB30G19	2471	4306	4462	219**
WH505	3103	3855	4271	187**
SED $_{(0.05)}$	175 *NS*	161 *NS*	160 *NS*	

SED = Standard error of the difference between SWM practice means; *NS* = not significant,
(** Significant P < 0.05). No significant differences were observed between varieties in response to SWM practice.

2.2.5 ICT-related activities

ICT activities aimed at enhancing access to information on markets, and agronomic and climate-smart agriculture by the project beneficiaries were further implemented. These included farmer profiling to better understand their needs, developing suitable products aimed at addressing their needs, and continued engagement with ICT partners. The profiling covered 19,775 farmers as indicated in Figure 3. After the profiling, messages suitable for farmers in different locations during the different periods of the farming season were crafted for sharing using SMS. The various messages developed and shared with farmers are available at this link: http://africa-rising-wiki.net/File:MWANGA_SMS.pdf Also, videos (http://bit.ly/AfricaRISING_TZ_Maize_Vids) were developed with community members covering subjects related to the different planting stages (preplanting, planting and growth phase, postharvest and sales, and records management). About 17,210 farmers were reached using SMS and 515 smallholder farmers reached through the video viewing sessions. The partners engaged to ensure continued use of the ICT platform include ESOKO, TARI, and district local governments.

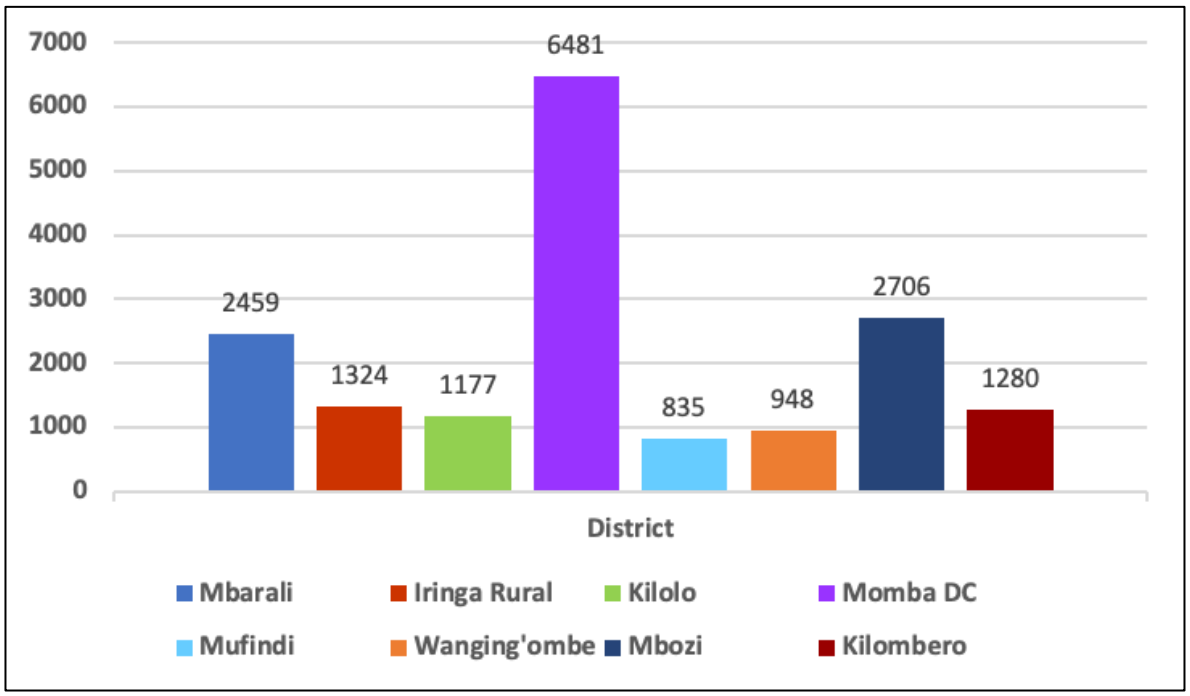

Figure 3. Farmers profiled in each district for ICT activities.

2.2.6 GIS-related activities

A compendium of maps showcasing the (i) biophysical and socioeconomic conditions that influence adoption of integrated agronomic technologies in the FtF ZoI in Tanzania and (ii) suitability of some of the improved maize varieties and inorganic fertilizers that were promoted by the project was developed. The maps are expected to help the extension and development agencies to better target improved maize varieties and inorganic fertilizers in the scaling out programs. The link to this document is available here: https://hdl.handle.net/10568/109958

2.2.7 Radio talk shows

As a result of reduced field activities during the period of March–June 2020 due to COVID-19 outbreak, the project conducted 11 live talk show radio programs (one hour each) aimed at building the capacities of farmers on the postharvest handling of maize and rice. The shows were conducted on the following six community radio stations in the project focus regions of Mbeya, Songwe, and Iringa: Ushindi and Baraka radios in Mbeya; Ice Radio in Njombe; Ilasi Radio in Songwe, and Nuru and Furaha radios in Iringa. The team of facilitators comprised staff of IITA, TARI, NAFAKA, and five agro-input companies (OCP Africa, BEULA, Agri SEED, CORTEVA, and SEEDCO). Listeners had the opportunity to ask questions, and many such questions were asked even after the show, indicating good reception and relevance of the messages. The programs were recorded and aired again for one month. Data from the different radio stations indicate that about 90,000 farmers were reached.

2.2.8 Production of training materials

The project developed training materials that will be used by partners for further scaling of technologies. Six sets of materials have been finalized (developed, pretested, designed, and typeset) and will be distributed by NAFAKA and IITA to partners at local government level in the project beneficiary districts. The ready materials (both English and Swahili versions) include:

No.	Title	Link (s)
1.	Rice production manual (*Mwongozo wa kufundisha kilimo bora cha mpunga*)	• https://hdl.handle.net/10568/109813 • https://hdl.handle.net/10568/109805
2.	Rice production calendars (*Kalenda ya kilimo bora cha mpunga*)—due to agroecological variations, different schemes in the different beneficiary districts had suitable calendars developed for them.	• https://hdl.handle.net/10568/109823 • https://hdl.handle.net/10568/109822 • https://hdl.handle.net/10568/109821 • https://hdl.handle.net/10568/109820 • https://hdl.handle.net/10568/109818
3.	Maize production manual for smallholder farmers in Tanzania (*Mwongozo wa kufundisha kilimo bora cha mahindi kwa wakulima wadogo nchini Tanzania*)	• https://hdl.handle.net/10568/109806
4.	Maize quality standards and specifications: A trainer's manual for smallholder farmers in Tanzania (*Viwango na vigezo vya ubora wa mahindi: Mwongozo wa mwezeshaji kwa wakulima wadogo nchini Tanzania*)	• https://hdl.handle.net/10568/109817 • https://hdl.handle.net/10568/109807
5.	Improved postharvest practices for reduction of losses and improvement of produce quality: A	• https://hdl.handle.net/10568/109814 • https://hdl.handle.net/10568/109804

	trainer's manual for smallholder farmers in Tanzania (*Shuguli zilizoboreshwa kwa ajili ya kupunguza upotevu na kuboresha mazao baada ya kuvuna: Mwongozo wa mwezeshaji kwa wakulima wadogo nchini Tanzania*)	
6.	Improved complementary feeding: A trainer's manual for nutrition and health care givers (*Utayarishaji bora wa vyakula vya Watoto wadogo: Mwongozo kwa watoaji huduma)*	• https://hdl.handle.net/10568/109816 • https://hdl.handle.net/10568/109803
7.	A compendium of maps on biophysical, socioeconomic context, and suitability of maize varieties and inorganic fertilizers in Tanzania	• https://hdl.handle.net/10568/109958
8.	Rice quality standards and specifications: Aflatoxin brochure: Brief overview on aflatoxin *(Ukweli kuhusu sumukuvu)*	• http://africa-rising-wiki.net/File:AflatoxinBR_kiswahili.pdf
9.	Aflatoxin fact sheet: All about aflatoxin: What it is, its effects, and how to control it *(Ijue sumukuvu: maana, athari na udhibiti wake)*	• http://africa-rising-wiki.net/File:AflatoxinBR2_kiswahili.pdf.pdf
10.	Recipe book: Soybean utilization for improved household nutrition: A compendium of common soybean recipes *(Matumizi ya soya katika kuboresha lishe ya kaya: Mkusanyiko wa mapishi mbalimbali)*	• https://hdl.handle.net/10568/109815 • https://hdl.handle.net/10568/109809
11.	Kalenda ya uzalishaji wa mbegu za mpunga zilizo azimiwa ubora (QDS): Halmashauri ya wilaya ya Kilombero	• https://hdl.handle.net/10568/109819
12.	Postharvest operations and quality specifications for rice: A trainer's manual for smallholder farmers in Tanzania	• https://hdl.handle.net/10568/109808

2.2.9 Problems and challenges

1. Outbreak of FAW in January 2020 in Songwe and Iringa regions. The pest was well managed by the project implementing team which ensured that demos were sprayed with the recommended insecticides. Appropriate technical assistance was provided to farmers by extension staff and VBAAs, and rural agro-dealers have stocked the right pesticides for farmers to access for use in their fields.
2. Heavy rains led to the destruction of some crops (especially beans and rice) and delays in the establishment of demos and QDS farms.

A farmer standing in her flooded rice paddy field in Lipangalala Village, Kilombero District. Photo credit: Filbert Mzee/ACDI VOCA.

Africa RISING – NAFAKA Staff together with some lead farmers assess the extent of rice paddy field flooding at Ichonde Village in Kilombero District. Photo credit: Japhet Masigo/IITA.

3. There was limited implementation of field-based activities due to the COVID-19 outbreak. Consequently, various options of communicating the key messages through digital platforms, including mobile telephone SMS and radio programs, were implemented, as well as holding of virtual project-related meetings where feasible.

2.2.10 Planned activities

None planned. The project ended on 30 September 2020. Therefore, this is the last project report.

3. INTEGRATION OF CROSS-CUTTING ISSUES AND USAID FORWARD PRIORITIES

3.1 Gender equality and women's empowerment

The approach of the Africa RISING-NAFAKA project has emphasized gender consideration at all levels of project implementation. In the process of building capacities of farmers, both males and females were trained, considering different gender groups, i.e., adult males and females and the youth (both sexes). Both male and female members have had equal opportunities in the groups and efforts have been made to increase the number of females taking part from about 30% at the beginning of the project to about 44%. Selection of beneficiaries for activities such as QDS production also deliberately focused on having at least 45% of female producers.

3.2 Youth engagement

Youth involvement has been a key aspect of project interventions. The youth were equally encouraged to participate in all activities. About 25% of the project participants were young adults under 29 years of age (also roughly divided as 45% female, 55% male). Like for females, the project put additional efforts in place to attract more youth, such as recruiting more young BAAs, artisans, and QDS producers, and targeting youth groups.

3.3 Local capacity development

The project has worked closely with Government agricultural extension staff at district and village levels. In addition, collaboration between Africa RISING and NAFAKA has supported and trained VBAAs who complemented extension staff trainings and played a key role as frontline actors in the rural agro-input dealer network. Furthermore, the project has worked with farmer groups and associations whose capacities have been developed in GAPs and related technical areas.

3.4 Integration and collaboration

The NAFAKA field staff has coordinated the Africa RISING-NAFAKA partnership project activities supported by Africa RISING in all the project districts. In addition, we have successfully collaborated with the private sector (CORTVEVA, Seed Co, ETG, BEULA Seeds, Agriseed, OCP, and A to Z) to support demo sites in all project districts. We have also collaborated with ESOKO for ICT-based services as well as NGOs, such as HELVETAS, for postharvest management activities.

3.5 Sustainability

The close collaboration with the GoT, extension staff at district level, and private sector actors aimed at linking the farmers to partners and development initiatives that will provide support beyond the life of the project. In collaboration with the NAFAKA project, the team worked with VBAAs and selected lead farmers who managed demo plots, provided access to inputs, and produced QDS for legumes and rice to sustain the availability of seeds of the varieties being taken to scale. The project team also had TARI as a core member; TARI will continue to provide the research service beyond the project end. Furthermore, the project

team has linked local input and other service providers (e.g., machinery, crop insurance) with farmers and local extension staff to ensure the technologies continue to be accessible after the project closure.

Regarding the sustainability of QDS activities, our efforts to form associations at cluster and apex levels have ensured that members continue to have access to services after the project end. We planned to support the associations in managing Savings and Internal Lending Communities/Committees (SILC) so that members will have resources to enhance their activities, although this activity was not effectively achieved due to reduced field activities as a result of COVID-19. We have also successfully linked the QDS producers to seed sources (TARI) in all districts.

To ensure the sustainability of the ICT interventions, we have lobbied the governments at district and regional levels to appreciate the importance of using ICT to deliver extension and therefore incorporate the related costs into their budgets. There has been positive feedback from all districts in the form of mobilizing resources to include the ICT component in their budgets. TARI institutes (Uyole, Hombolo, Dakawa), seed companies (Meru Agro), micro-finance institutions, and millers have also expressed willingness to support the ICT platform, especially with respect to developing content and delivering bundled services to the smallholder farmers who would otherwise be left out of such engagements because they are considered to be financially risky.

Additional sustainability aspects suggested during the project close-out meetings held in all project districts in August 2020 include:

i. Promoting and certifying youth in communities to collectively become service providers (e.g., pesticide spray groups, artisans). This will ensure continued use of the introduced technologies such as postharvest machinery.
ii. Leveraging more digital solutions for behavior change and knowledge dissemination, e.g., social media platforms.

A summary of resolutions and commitments of the various partners resulting from the close-out meetings is available at this link: http://africa-rising-wiki.net/AR-NAFAKAcloseouts

3.6 Environmental compliance

In accordance with the project PERSUAP, the team emphasizes the judicious use of agro-inputs by promoting integrated soil fertility management without damaging the natural resource base. In semiarid locations, we have been encouraging farmers to use improved in-situ water conservation technologies, such as tied ridges. Management technologies for soils on steep slopes or those affected by acidity or high salinity and calcium content underlie the approach used in this project. Given the increase in problems of water availability for production on some occasions (we notably had too much rains during the current season, but this is not the norm), we have emphasized the importance of using organic manure and minimizing the use of water in rice production. This has been done by promoting the water-saving technologies such as the AWD technology and by establishing bunds around paddy plots. Also, the training of farmers and extension staff on the safe use and handling of agro-chemicals has been one of the focus areas of the project.

3.7 Global climate change

Since the project has been operating in the context of climate change, we have embraced the scaling of technologies and agricultural practices that enhance resilience to climate variability.

3.8 Policy and governance support

The project's activities have been in line with the policy of GoT in fostering agricultural development and also contributing to ASDPII. Consequently, the team has received support from national, regional, district, and village governments in all areas where the project activities were implemented in the form of joint implementation of development activities.

3.9 Private sector engagement, Public Private Partnerships (PPP), and Global Development Alliance (GDA) collaboration

The project has worked directly with agro-input/seed companies in Tanzania, e.g., Meru Agro, SYNGENTA, Seed Co, and CORTVEVA. Their staff have been instrumental in providing guidance on matters related to agro-inputs as well as in participating in the rural agro-input network spearheaded by the NAFAKA project. We have also worked closely with ESOKO to ensure that we integrate ICTs in our activities.

The demand for mechanical shellers/threshers and hermetic storage bags has increased owing to the increase in awareness about the technologies. We established a partnership with Poly Machinery Co. Ltd based in Dar es Salaam that can supply mechanical shellers/threshers and provide spare parts and after sales services to farmers. We also established partnerships with two manufacturers of hermetic storage bags, i.e., A to Z and PPTL Co. Ltd. The companies have shown interest in continuing to work with farmers and other supply chain actors to strengthen the supply network, especially in the rural areas. This will enhance continued use of the technology. A to Z will also supply Aflasafe, which was approved for use by farmers in Tanzania in 2018, to mitigate aflatoxin contamination of grains.

3.10 Science, technology, and innovation

The use of ICTs via the "Mwanga" platform as well as GIS for the targeting and scaling of technologies and community radios will contribute to good results in the farming communities through the uptake of improved technologies in the form of improved crop varieties, GAPs, postharvest management, pests and diseases management, and natural resource management.

4. STAKEHOLDER PARTICIPATION AND INVOLVEMENT

See sections 3.3 and 3.4.

5. MANAGEMENT AND ADMINISTRATIVE ISSUES

Nothing to report.

6. MONITORING, EVALUATION, AND LEARNING

The PMP indicators are presented in Annex 1.

7. SPECIAL EVENTS FOR NEXT QUARTER

None.

8. ANNEXES

8.1 Annex I. Performance against PMP indicators for Project Year V (2019/20)

Indicator / disaggregation	Target 2020	Quarter 1 (Oct–Dec 2019)	Quarter 2 (Jan– Mar 2020)	Quarter 3 (Apr–Jun 2020)	Quarter 4 (Jul – Sept 2020)
EG.3.2 Number of individuals participating in USG food security programs [IM-level]	70,852	27,725	43,851	28,179	6522
* EG.3.2-24 Number of individuals in the agriculture system who have applied improved management practices or technologies with USG assistance [IM-level]	66,188				**99,792**
*EG.3.2-25 Number of hectares under improved management practices or technologies with USG assistance [IM-level]	92,000				**126,037.3**

8.2 Annex II: Success stories

AMINA—Why I can't stop producing bean quality declared seed

The upward tick of the yield from Amina Ngoka's one-acre bean farm within the span of a one-year (2018–2019) cropping season has been nothing short of impressive! This farmer from Ifwagi Village, which is located in Iringa Region, Tanzania has managed to triple her bean crop yield after adopting a new bean variety from the Africa RISING-NAFAKA project and applying GAPs for beans production.

"Back in 2018, I was trained by staff of the TOSCI and the Africa RISING-NAFAKA project on QDS production for beans and this marked my epic turn-around as a beans grower," notes Amina. Before the training, she would only harvest a paltry 180 kg of beans (using 60 kg seed during planting) from her one-acre field. This is a far cry from her most recent harvest in 2019, where from the same field she harvested 700 kg of QDS while using only 30 kg of seed.

Amina produces QDS bean seed primarily for sale to her fellow farmers in Ifwagi Village and beyond, especially those who are eager to acquire the improved varieties after witnessing her impressive yields.

"In the past, all my harvest used to be for consumption by my family, however, now my outlook is to sell the QDS seed and earn money. For example, in 2018, I sold at least 400 kg of QDS at the cost of TShs2000 per kilogram. While in 2019, I opted to split up and plant QDS of two different bean varieties—Njano Uyole and Mwasipinjele. I harvested 700 kg and 600 kg for each variety, respectively, and sold at TShs1500 per kilogram," explains Amina.

Amina is proud of whom she has become—the bean QDS producer. "There are lots of opportunities in the production of legume crops that I never saw before! For example, there is massive demand for quality bean seeds; farmers just don't know where to get them sometimes," she notes.

With the significant benefits accruing from bean QDS production, Amina has been able to contribute significantly to the new house that she has been building together with her husband. She also uses part of her earnings to pay her children's school fees and support an orphan she adopted. In 2019, she bought 100 chicks from the capital accumulated from the QDS production business and has opened a grocery shop near her house.

Happy farmer, Amina scoops a handful of QDS from a storage sack at her home. Photo credit: Eveline Massam/IITA.

QDS bean variety Uyole 03 (Mwaspanjele) in a storage sack at Amina's home. Photo credit: Eveline Massam/IITA.

SARO 5—the 'miracle' rice variety putting a smile on farmers' faces

"Five years back the only seeds available to farmers here in my village were the local varieties. These local varieties were highly preferred by local buyers, however, they were also quite low-yielding," notes Emilia Eli Mlingo, a rice farmer from Kapunga Village, in Mbarali District, southwest Tanzania.

For the past 30 years, this mother of seven has steadfastly engaged in rice production. However, as time has gone by, so have her yields also declined steadily. From her one-hectare paddy field, her best harvests were never more than 28 bags (each 100 kg).

"It was not only me experiencing the dismal yields, my fellow farmers too had come to sort of accept that this was how things were," notes Emilia.

"Most of us used to plant the most locally accessible rice seeds like Zambia and Mwendambio. In addition to this, none of us was well informed about the good agricultural practices to follow in our farms in order to boost not only the yield, but also the quality of grains harvested, which is an important aspect when selling," she says.

In 2017, Emilia's fortunes started to change when upon the invitation of the Mbarali District Extension Officers, she joined the Africa RISING - NAFAKA project rice production demos and training in Kapunga Village. Through the training and demos, for a whole year, Emilia and her fellow farmers were trained on GAPs to achieve high yields in rice production; these training included: proper land preparation, weed management (types and application of pesticides respectively), seedlings, water management, proper seedlings, and harvesting. Importantly, the project team also introduced them to the SARO 5 variety, which they planted in demo fields to compare its yields with those of other rice varieties that farmers in Mbarali District grew.

Inspired by the outcomes (better yield) from the demo plots, Emilia made up her mind to apply all the new knowledge she had gained about rice production on her farm for the 2018/2019 cropping season. Her resolve was further incentivized by the Africa RISING-NAFAKA project team, who provided her and her fellow farmers with SARO 5 rice variety seeds.

When harvesttime came around, Emilia was elated.

"This is a real miracle. SARO 5 is a miracle seed," she notes. "In 2019, I used 25 kilograms of SARO 5 seed on my one-hectare farm and harvested 86 bags! This is a big contrast to the 28 bags maximum that I used to harvest up till the 2017/2018 cropping season," she adds.

From the harvest, Emilia sold 40 bags at TShs50,000 per bag, consequently earning TShs2,000,000. She has used the money to support her grandchildren's school fees and other domestic needs. The remaining 46 bags were saved for food and seed.

Emilia has volunteered to work with the project to make the impressive SARO 5 seed available to more farmers within the District and beyond. In this new collaboration, Emilia will be expanding her rice production venture to include the production of QDS of SARO 5 on an extra one and half acres of fallow family land.

“I am very thankful to the Africa RISING-NAFAKA project for this activity that has literally changed my life and that of my fellow rice farmers here in Kapunga Village. I learned so much and now have the capacity to also train others about improved rice production,” she says.

“I promise to continue disseminating the knowledge I have gained on GAPs and keep on producing QDS so that my fellow farmers can always have access to this wonderful improved seed. My wish is to ensure that my fellow farmers can equally improve their yields and earn more,” she emphasizes.

Emilia inspecting her rice paddy in Kapunga Village. Photo credit: Didas Kimaro/Tanzania Agricultural Research Institute, Dakawa.

Beating the drought in Tanzania's semiarid Iringa Region

For Simon Kabongo, a maize farmer from Mkungugu Village in the lowlands of Tanzania's Iringa District, misery came both in the rainy season and only got worse during the dry season. Like most farmers inhabiting the lowlands of Tanzania, a common paradox is that in the dry season their crops (predominantly maize) face drought, while in the rainy season their crops are washed away thanks to too much rain. Over 90% of Tanzania's smallholder farmers grow maize, which is the staple food for the majority of Tanzanians. The crop is usually grown under low input, rainfed conditions. The choice to grow maize, even in areas of insufficient rainfall, is driven by a strong dietary preference for maize. While the position of maize as the centerpiece of family diets in Tanzania is yet to be threatened, its yield on farms has long been stifled by many factors. Key among them being irregular rainfall (limited moisture) and poor agronomic practices by farmers.

In 2017, the Africa RISING-NAFAKA project-initiated trainings aimed at helping farmers living in the lowlands of Tanzania's Iringa District to overcome the 'excess' and 'too little' water challenge as a first step to improving their maize yields.

"Like most of my fellow farmers in Mkungugu Village, the training by the Africa RISING-NAFAKA project opened my eyes to lots of things that I had not been doing well on my farm. For example, I just never bothered to check the quality of maize seed I used during the planting season. In addition to that, I didn't bother about things like plant spacing and fertilizer application, and I most certainly knew nothing about how best to deal with the drought situation," explains Simon. "Looking back, this is the main reason for my poor yields every year," he adds.

For a long time, Simon had come to accept that the best yield he could muster out of his one-hectare farm was a maximum of 5 sacks of maize. This is a stark difference to his current harvests of between 17 and 25 sacks of maize average yield from the same one-hectare plot!

So, what changed?

"From the demo plot that was set up by the project in my village as well as the trainings, I learned firsthand basic things like good land preparation, proper plant spacing, the best performing improved maize seed varieties that are suited for our location, best fertilizer application practices, and, quite importantly, how to effectively harvest water for my crop within the farm," explains Simon.

"But just learning was not enough. After seeing great results in the demo plot, I had to go and replicate the same within my farm! The results have been impressive," he quips.

The taste of success is one that has got Simon yearning for more, perhaps to make up for all the years of abysmal maize yields. In the 2019/20 cropping season, he has decided to utilize a fallow four-hectare family land to grow more maize with a view to selling his extra yields at the market.

Simon's turn-around story has definitely won him admirers in Mkungugu Village. His fellow farmers admire his achievements and have constantly consulted him about the adjustments they need to make to boost their harvests.

"I receive many questions from them. They like what they see on my farm and whenever they come to seek my advice, I freely share what I have learned from the project and my experiences. For many people, they learn best when they see something being done practically. For example, after the first cropping season in 2018/2019 where I used tied ridges on my farm and got good yields, I noticed that my neighbor who had casually asked me about it went ahead and did it in the next cropping season," he notes with a smile.

"I am now assured of food for my family, with the good harvests and I have enough to store and later sell at the market," adds Simon.

Improved maize yields for smallholder farmers like Mr Simon means better food security in general for his family of four children and one wife.

It is estimated that between 65 and 80 percent of all maize produced by Tanzania's smallholders is consumed within the producing households. Only 20 to 35 percent enters commercial channels.

Between October 2017 and March 2020, more than 64,000 farmers in both maize and rice value chains have adopted the good agricultural practices and promising crop varieties introduced to them through the Africa RISING-NAFAKA project. In the process of this transformative change, the project has also put 87,856 hectares of land under improved management practices or technologies used by smallholder farmers.

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